

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1.(Original) A positioning system for detecting the position of a terminal, comprising:

an illumination device configured to transmit unique information from a given installation position;

a terminal configured to receive the unique information transmitted from the illumination device; and

position estimation means configured to estimate the position of the terminal based on illumination installation position information and the unique information received by the terminal, said installation position information including the unique information and position information indicating the installation position of the illumination device in association with each other,

wherein the position estimation means is configured to:

read out from the illumination installation position information the position information corresponding to the unique information based on one or more unique information received by the terminal within a past predetermined time period; and

estimate the position of the terminal based on the read out position information.

2.(canceled)

3.(canceled)

4.(canceled)

5.(Original) The positioning system according to claim 1, wherein

the position estimation means is configured to estimate the position of the terminal based on the unique information received by the terminal most recently.

6.(Original) The positioning system according to claim 1, wherein

the position estimation means is configured to estimate the position of the terminal based on most frequently received unique information among one or more unique information received by the terminal within a past predetermined time period.

7.(Original) The positioning system according to claim 1, wherein

the position estimation means is configured to:

add a weighting value to one or more unique information received by the terminal within a past predetermined time based on the reception time of the respective unique information; and

estimate the position of the terminal based on unique information selected based on a result of the addition.

8.(Original) The positioning system according to claim 1, wherein

the position estimation means is configured to:

increase the weighting value as the reception time becomes newer;

select unique information having the largest value resulting from the addition; and

estimate the position of the terminal based on the selected unique information.

9.(canceled)

10.(Currently Amended) The positioning system according to ~~any one of claims 1 and 5 to 8~~
claim 1, wherein:

the illumination device comprises a light emission unit for emitting an illumination light and a transmission unit for transmitting the unique information;

the transmission unit comprises a white LED for emitting a visible light signal; and

the white LED is configured to transmit the unique information on the visible light signal.

11.(Currently Amended) The positioning system according to ~~any one of claims 1 and 5 to 8~~ claim 1, wherein:

the illumination device comprises a light emission unit for emitting an illumination light and a transmission unit for transmitting the unique information;

the transmission unit comprises an infrared LED for emitting an infrared ray signal; and

the infrared LED is configured to transmit the unique information on the infrared ray signal.

12.(Currently Amended) The positioning system according to ~~any one of claims 1 and 5 to 8~~ claim 1, wherein:

the illumination device comprises a light emission unit for emitting an illumination light and a transmission unit for transmitting the unique information;

the transmission unit comprises a wireless communication unit for transmitting a radio signal;
and

the wireless communication unit is configured to transmit the unique information on the radio signal.

13.(Currently Amended) The positioning system according to ~~any of claims 1 and 5 to 8~~ claim 1, wherein

the transmission unit is configured to transmit the unique information to the terminal at random timing.

14.(canceled)

15.(Currently Amended) The positioning system according to ~~any one of claims 10 to 13~~ claim 10, wherein:

the illumination device comprises a light emission unit for emitting an illumination light, a transmission unit for transmitting the unique information, and a power source unit;

each of the light emission unit and transmission unit is configured to be separatable from the power source unit and is connected to the power source unit using a power source interface of a fluorescent tube for a fluorescent illumination device.

16.(Original) The positioning system according to claim 15, wherein

each of the light emission unit and transmission unit incorporates a power conversion unit.

17. (Original) The positioning system according to claim 16, wherein

the power conversion unit is configured to convert an AC power supplied from the power source interface of a fluorescent tube into a DC power used by the light emission unit and transmission unit.

18. (Original) The positioning system according to claim 15, wherein

the light emission unit uses a fluorescent tube, and

the transmission unit incorporates the power conversion unit.

19. (Original) The positioning system according to claim 18, wherein

the power conversion unit is configured to convert an AC power supplied from the power source interface of a fluorescent tube into a DC power used by the transmission unit.

20. (Original) The positioning system according to claim 18, wherein

the power conversion unit comprises an overcurrent protection circuit for protecting the power source unit of the fluorescent illumination device.

21. (Original) The positioning system according to claim 18, wherein

the power conversion unit comprises a power holding circuit for holding a power required for transmission of the unique information.

22. (Original) The positioning system according to claim 18, wherein

two electrode terminals, which are the power source interface of a fluorescent tube, formed at one side of the fluorescent tube and power input terminals, which are connected to the power conversion unit for supplying a power to the transmission unit, are electrically connected in parallel to each other.

23. (Original) The positioning system according to claim 22, wherein:

the fluorescent tube is a straight fluorescent tube having two electrode terminals respectively on both sides thereof;

the straight fluorescent tube further comprises a power acquisition unit which is connected in parallel to the two electrode terminals formed at one side thereof and acquires a power to be supplied to the power conversion unit; and

the power acquisition unit is formed into a plate having two holes through which the two electrode terminals are inserted.

24. (Original) The positioning system according to claim 23, wherein

the power acquisition unit has a thickness of 1.3 mm or less.

25. (Currently Amended) The positioning system according to ~~any one of claims 10 to 13~~ claim 10, wherein:

the illumination device comprises a light emission unit for emitting an illumination light, a transmission unit for transmitting the unique information, and a power source unit; and

each of the light emission unit and transmission unit is connected to the power conversion unit using a power source interface of an incandescent light bulb for an incandescent light bulb illumination device.

26. (Original) The positioning system according to claim 25, wherein

the light emission unit and transmission unit incorporate a power conversion unit.

27. (Original) The positioning system according to claim 26, wherein

the power conversion unit is configured to convert a DC power voltage supplied from the power source interface of an incandescent light bulb into a voltage form that the light emission unit and transmission unit use.

28. (canceled)

29. (canceled)

30. (Currently Amended) The positioning system according to ~~any one of claims 10 to 13~~ claim 10, wherein:

the illumination device comprises a light emission unit for emitting an illumination light, a transmission unit for transmitting the unique information, a solar battery unit, and a rechargeable battery for storing a power supplied from the solar battery unit; and

the transmission unit is configured to transmit the unique information by using a power supplied from the solar battery unit and to transmit the unique information when a power required for the transmission of the information has been stored in the rechargeable battery.

31. (Currently Amended) The positioning system according to ~~any of claims 10, 11 to 13, 15 to 27, and 30~~ claim 10, wherein:

the illumination device comprises a light emission unit for emitting an illumination light and a transmission unit for transmitting the unique information; and

the transmission unit is configured to determine an angle at which the unique information is transmitted depending on the size of the area within which the unique information can be received and installation level of the illumination device.

32. (Currently Amended) The positioning system according to ~~any of claims 10, 11 to 13, 15 to 27, and 30~~ claim 10, wherein:

the illumination device comprises a light emission unit for emitting an illumination light and a transmission unit for transmitting the unique information; and

the transmission unit is configured to determine the number and output power of LEDs constituting the transmission unit that transmits the unique information depending on the size of the area within which the unique information can be received, installation level of the illumination device, gain characteristics of a receiver of the terminal for receiving the unique information, and output characteristics of the LEDs constituting the transmission unit that transmits the unique information.

33. (Original) The positioning system according to claim 32, wherein

the transmission unit comprises a plurality of LEDs for emitting a light signal, the LEDs being configured to transmit the unique information on the light signal in different directions.

34. (Original) The positioning system according to claim 33, wherein

the transmission unit is configured to determine the number of LEDs that transmit the unique information depending on a difference in the transmission direction between the adjacent two LEDs, transmission angles of LEDs, size of the area within which the unique information can be received, and installation level of the illumination device.

35. (Currently Amended) The positioning system according to ~~any of claims 1, 5 to 8, 10 to 13, 15 to 27, and 30 to 34~~ claim 1, wherein

the illumination device is configured to emit a light having a color indicating that it is transmitting the unique information.

36. (Currently Amended) The positioning system according to ~~any of claims 1, 5 to 8, 10 to 13, 15 to 27, and 30 to 34~~ claim 1, wherein

the illumination device is configured to emit a light using different colors for each service type.

37. (Currently Amended) The positioning system according to ~~any of claims 1, 5 to 8, 10 to 13, 15 to 27, and 30 to 34~~ claim 1, wherein

the illumination device is configured to emit a light using different colors for each service provider providing a service using the position information of the terminal.

38. (Currently Amended) The positioning system according to claim 36 ~~or claim 37~~, wherein

the illumination device is configured to illuminate the area within which the terminal can receive the unique information with an illumination light.

39. (canceled)

40. (Currently Amended) The positioning system according to any of claims ~~1, 5 to 8, 10 to 13, 15 to 27, and 30 to 38~~ claim 1, wherein

the illumination installation position information is configured to be created by associating the unique information collected by the terminal and installation position of the illumination device with each other.

41. (Currently Amended) The positioning system according to ~~any of claims 1, 5 to 8, 10 to 13, 15 to 27, 30 to 38, and 40~~ claim 1, wherein:

the positioning system further comprises a second positioning system; and

the positioning system and second positioning system can be operated in a switchable manner.

42. (Original) The positioning system according to claim 41, wherein

the second positioning system is a positioning system using a wireless LAN.

43. (Currently Amended) The positioning system according to claim 41 ~~or claim 42~~, wherein

the positioning system is configured to identify the position of the terminal by using the unique information that the illumination device transmits, in the case where requested terminal position information is logical position information.

44. (Currently Amended) The positioning system according to claim 41 ~~or claim 42~~, wherein

the positioning system is configured to identify the position of the terminal by using the second positioning system, in the case where the positioning system could not identify the position of the terminal by using the unique information.

45.(Currently Amended) The positioning system according to claim 41 ~~or claim 42~~, wherein

the positioning system is configured to determine whether to identify the position of the terminal by using the unique information or by using the second positioning system, based on the type of the requested terminal position information.

46. (canceled)

47. (Currently Amended) The positioning system according to ~~any one of claims 1, 5 to 8, 10 to 13, 15 to 27, 30 to 38, and 40 to 45~~ claim 1, wherein

the positioning system is configured to display acquired terminal position information and to switch a display method of position information depending on the accuracy of acquired terminal position information.

48. (Currently Amended) The positioning system according to ~~any one of claims 1, 5 to 8, 10 to 13, 15 to 27, 30 to 38, 40 to 45, and 47~~ claim 1, wherein

the positioning system has a function of storing attribute information concerning the terminal and of displaying the position information of the terminal corresponding to specified attribute information.

49. (Original) The positioning system according to claim 48, wherein

the positioning system is configured to store, as the attribute information of the terminal, a name of a department to which a terminal user belongs.

50. (canceled)

51. (Currently Amended) The positioning system according to ~~any one of claims 47 to 49~~ claim 47, wherein

the positioning system is configured to display the terminal position information corresponding to a specified display condition and to specify, as the display condition, information of floors in which the terminal exists.

52. (Currently Amended) The positioning system according to ~~any of claims 1, 5 to 8, 10 to 13, 15 to 27, 30 to 38, 40 to 45, 47 to 49, and 51~~ claim 1, wherein

the illumination device comprises a rechargeable battery and is configured to transmit information by using a power supply from the rechargeable battery in the case where it cannot use a power source thereof.

53. (canceled)

54. (Currently Amended) The positioning system according to ~~any one of claims 1, 5 to 8, 10 to 13, 15 to 27, and 30 to 38, 40 to 45, 47 to 49, 51, and 52~~ claim 1, wherein

the positioning system is configured to:

identify a user terminal in response to a position information request concerning a user of the terminal;

acquire the position information of the identified terminal; and

select one terminal in order of priority set for the respective terminals to acquire the position information thereof, in the case where a plurality of the user terminals exist.

55. (Original) The positioning system according to claim 54, wherein

the priority is configured to be determined based on the type of the terminal.

56. (Original) The positioning system according to claim 54, wherein

the priority is configured to be determined such that the position information of the terminal using a wireless LAN has a higher priority.

57. (Original) The positioning system according to claim 54, wherein

the priority is configured to be determined based on presence/absence of a response from the terminal.

58.(Original) The positioning system according to claim 54, wherein

the priority is configured to determined based on the use state of the terminal.

59. (Original) A positioning method of a positioning system for detecting the position of a terminal,

the positioning system comprising:

an illumination device configured to transmit unique information from a given installation position;

a terminal configured to receive the unique information transmitted from the illumination device; and

position estimation means configured to estimate the position of the terminal based on illumination installation position information and the unique information received by the terminal, said installation position information including the unique information and position information indicating the installation position of the illumination device in association with each other,

the positioning method comprising:

reading out from the illumination installation position information the position information corresponding to the unique information based on one or more unique information received by the terminal within a past predetermined time period, by using the position estimation means; and

estimating the position of the terminal based on the read out position information by using the position estimation means:.

60. (canceled)

61. (canceled)

62. (Original) The positioning method according to claim 59, wherein

a white LED is used as a light emission source of the illumination device and the unique information is transmitted by using a visible light signal emitted by the white LED.

63. (Original) The positioning method according to claim 59, wherein

the unique information is transmitted by using an infrared ray signal emitted by an infrared LED.

64. (Original) The positioning method according to claim 59, wherein

the unique information is transmitted by using a radio signal.

65. (Currently Amended) The positioning method according to ~~any of claims 59 and 62 to 64~~
claim 59, wherein

the unique information is transmitted to the terminal at random timing by the illumination device.

66. (Currently Amended) The positioning method according to ~~any of claims 59 and 62 to 65~~

claim 59, wherein

in the case where the light emission unit and transmission unit of the illumination device are connected to a power source unit by means of a power source interface of a fluorescent tube for a fluorescent illumination device, the light emission unit and transmission unit convert an AC power supplied from the power source interface of a fluorescent tube into a DC power.

67. (Currently Amended) The positioning method according to ~~any of claims 59 and 62 to 65~~
claim 59, wherein

in the case where the light emission unit and transmission unit of the illumination device are connected to a power source unit by means of a power source interface of an incandescent light bulb for an incandescent light bulb illumination device, the light emission unit and transmission unit convert a DC power voltage supplied from the power source interface of an incandescent light bulb into a voltage form that they can use.

68.(Currently Amended) The positioning method according to any of claims 59 and 62 to 67
claim 59, further comprising

determining an angle at which the unique information is transmitted from the illumination device depending on the size of the area within which the unique information can be received and installation level of the illumination device.

69. (Currently Amended) The positioning method according to ~~any of claims 59 and 62 to 68~~
claim 59, further comprising

determining, in the case where a plurality of LEDs are arranged in the illumination device so as to emit the unique information in different directions, the number of LEDs that transmit the unique information depending on a difference in the transmission direction between the adjacent two

LEDs, transmission angles of LEDs, size of the area within which the unique information can be received, and installation level of the illumination device.

70.(Currently Amended) The positioning method according to ~~any of claims 59 and 62 to 69~~
claim 59, further comprising:

collecting the unique information by using a terminal that can receive the unique information that the illumination device transmits; and

creating the illumination installation position information to be stored in a positioning system by associating the position at which the unique information is received and received unique information with each other.

71. (Currently Amended) The positioning method according to ~~any of claims 59 and 62 to 70~~
claim 59, further comprising

identifying, in the case where position detection processing can be switched between the positioning system and a second positioning system and where a terminal position information request is logical position information, the position of the terminal by using the unique information that the illumination device transmits.

72. (Original) The positioning method according to claim 71, wherein

a positioning method carries out by the second positioning system is a positioning method using a wireless LAN.

73. (Currently Amended) The positioning method according to claim 71 ~~or 72~~, further comprising

identifying, in the case where the position of the terminal could not be identified by using the unique information, the position of the terminal by using the second positioning system.

74. (Currently Amended) The positioning method according to claim 71 ~~or claim 72~~, further comprising

determining whether to identify the position of the terminal using the unique information or using the second positioning system based on the type of the requested position information.

75. (canceled)

76. (canceled)

77. (canceled)

78. (Original) A program for an application server in a positioning system including an illumination device which transmits unique information from a given installation position, a terminal which receives the unique information, and an application server realized by a computer connected in a communicable manner to a terminal and detecting the position of the terminal based on the unique information received by the terminal,

the program allowing a computer serving as the application server to function as display means configured to:

display the position information of the detected terminal; and

switch a display method of position information depending on the accuracy of acquired terminal position information.

79. (Original) The program according to claim 78, wherein

the display means is configured to:

store attribute information concerning the terminal; and

display the position information of the terminal corresponding to specified attribute information.

80. (canceled)

81. (canceled)

82. (Currently Amended) The program according to claim 78 ~~or 79~~, wherein:

the display means is configured to display the terminal position information corresponding to a specified display condition; and

the program further allows the computer serving as the application server to function as acquisition means configured to:

receive a position information request concerning a terminal user;

identify the terminal that the user uses;

acquire the position information of the identified terminal; and

in the case where a plurality of the user terminals exist, select one terminal in order of priority set for the respective terminals to acquire the position information thereof.

83.(Original) The program according to claim 82, wherein

the acquisition means is configured to determine the priority based on the type of the terminal.

84. (Original) The program according to claim 82, wherein

the acquisition means is configured to determine the priority such that the position information of the terminal using a wireless LAN has a higher priority.

85. (Original) The program according to claim 82, wherein

the acquisition means is configured to determine the priority based on presence/absence of a response from the terminal.

86. (Original) The program according to claim 82, wherein

the acquisition unit is configured to determine the priority based on the use state of the terminal.

87. (Original) The positioning system according to claim 18, wherein

the power conversion unit comprises protection means for supplying a DC power to the transmission unit only when an electrical connection between the power conversion unit and transmission unit is established.

88.(Original) The positioning system according to claim 87, wherein:

the protection means comprises current detection means, determination means, and switching means;

the current detection means is configured to detect the output current value of the power conversion unit and notifies the determination means of the detected output current value;

the determination means is configured to compare the notified output current value and a previously set threshold value; and

in the case where the output current value is smaller than the threshold value, output of a DC power is stopped by the switching means, while in the case where the output current value is larger than the threshold value, a DC power is output by the switching means.

89.(Original) The positioning system according to claim 18, wherein

the power conversion unit and transmission unit are connected by a connection interface, the connection interface comprising insulating means configured to prevent an electrical contact from outside at connection time.

90. (Original) The positioning system according to claim 89, wherein

the connection interface is an electrode covered by an insulating body.

91. (Currently Amended) The positioning system according to ~~any of claims 1, 5 to 8, 10 to 13, 15 to 27, 30 to 38, and 40~~ claim 1, wherein:

the terminal is carried by a person entering a specified area; and

the positioning system comprises:

entering person detection means configured to detect the person who has entered the specified area;

entering person information management means configured to manage information concerning the person who has entered the specified area;

leaving person detection means configured to detect a person who has left the specified area;

leaving person information management means configured to manage information concerning the person who has left the specified area; and

remainder identification means configured to identify a person who remains in the specified area, wherein

the remainder identification means is configured to:

compare entering person information managed by the entering person management means and leaving person information managed by the leaving person information management means;

identify a person who has entered the specified area but has not left the specified area as a remainder; and

identify the position of the terminal carried by the remainder.

92. (Original) The positioning system according to claim 91, wherein

the terminal comprises:

signal reception means configured to receive the unique information transmitted from the illumination device; and

information transmission means configured to transmit the received unique information and terminal identification information on a radio signal, wherein

the position of the terminal is identified based on the unique information and terminal identification information transmitted from the terminal.

93. (Original) The positioning system according to claim 92, wherein

the information transmission means utilizes a PHS.

94. (Original) The positioning system according to claim 91, wherein

the entering person detection means and leaving person detection means are constituted by:

a plurality of the illumination devices installed near a gateway to the specified area;

storage means configured to store the unique information and terminal identification information; and

moving direction detection means configured to detect the moving direction of the person carrying the terminal from the stored unique information and terminal identification information,

wherein:

the terminal, which is carried by a person who passes through the gateway from outside of the specified area and enters or leaves the specified area, is configured to:

receive the unique information transmitted from the illumination device; and

use the storage means to store the received unique information and terminal identification information;

the moving direction detection means is configured to:

refer to a change of the unique information transmitted from the specified terminal stored by using the storage means;

estimate the moving direction of the person carrying the terminal;

detect the person as an entering person in the case where the moving direction is toward the inside of the specified area; and

detect the person as a leaving person in the case where the moving direction is toward the outside of the specified area.

95. (Original) The positioning system according to claim 92, wherein

the storage means is set outside the terminal, and

the terminal and storage means are configured to communicate with each other using the information transmission means.

96. (Original) The positioning system according to claim 91, wherein

the leaving person detection means configured to detect, as a leaving person, the person carrying the terminal that has received the unique information transmitted from the illumination device installed outside the specified area.

97. (Original) The positioning system according to claim 91, wherein

the positioning system is configured to be switched to a second positioning system.

98. (Original) The positioning system according to claim 92, wherein

the second positioning system is configured to identify the position of a PHS base station with which the terminal communicate, as the position of the terminal.

99. (Original) The positioning system according to claim 91, wherein

the entering person detection means comprises:

a reading device configured to:

store information for the person to identify him or herself; and

read out the information from a second terminal carried by the person; and

an entrance permission device which allows the person to enter the specified area in the case where readout of the information succeeds, wherein

the entering person information management means is storage means configured to store the information of the person allowed to enter the specified area.

100. (Original) The positioning system according to claim 91, wherein

the leaving person detection means comprises:

a reading device configured to:

store information for the person to identify him or herself; and

read out the information from a second terminal carried by the person; and

an exit permission device configured to allow the person to leave the specified area in the case where readout of the information succeeds, wherein

the leaving person information management means is storage means configured to store the information of the person allowed to leave the specified area.

101. (Original) The positioning system according to claim 91, wherein

the leaving person detection means comprises:

a reading device configured to:

- store information for the person to identify him or herself; and
- read out the information from a second terminal carried by the person;

an exit permission device which allows the person to leave the specified area in the case where readout of the information succeeds or a request from outside is received,

a plurality of the illumination devices installed near the gateway to the specified area;

storage means configured to store the unique information and terminal identification information; and

moving direction detection means configured to detect the moving direction of the person carrying the terminal from the stored unique information and terminal identification information, wherein

in the case where the exit permission device allows the person to leave the specified area in response to a request made from outside irrespective of success or failure of the readout of the information,

the terminal, which is carried by the person who enters the specified area through the gateway and leaves from the specified area, is configured to;

- receive the unique information transmitted from the illumination device; and
- use the storage means to store the unique information and terminal identification information; and

the moving direction detection means is configured to:

- refer to a change of the unique information transmitted from the specified terminal stored by using the storage means;
- estimate the moving direction of the person carrying the terminal; and
- detect the person as a leaving person in the case where the moving direction is toward the outside of the specified area.

102. (Currently Amended) The positioning system according to ~~any of claims 99 to 101~~ claim 99, wherein:

the second terminal is a noncontact IC card; and

the reading device is a card reader.

103. (Currently Amended) The positioning system according to ~~any of claims 1, 5 to 8, 10 to 13, 15 to 27, 30 to 38, and 40~~ claim 1, wherein

the transmission unit is installed to a fixing body such that the direction in which the transmission power of the transmission unit becomes maximum is downward.

104. (Original) The positioning system according to claim 103, wherein

a receiver of the unique information that the terminal has is attached to a moving body such that the direction in which the reception gain of the receiver becomes maximum is upward.

105. (Currently Amended) The positioning system according to ~~any of claims 1, 5 to 8, 10 to 13, 15 to 27, 30 to 38, and 40~~ claim 1, wherein

the transmission unit is installed to a fixing body such that the direction in which the transmission power of the transmission unit becomes maximum is horizontal.

106. (Original) The positioning system according to claim 105, wherein

the receiver is attached to a moving body such that the direction in which the reception gain of the receiver becomes maximum is horizontal.

107. (Original) The positioning system according to claim 106, wherein

two receivers are attached to the moving body.

108. (Original) The positioning system according to claim 107, wherein

the two receivers are attached to a moving body such that the directions in which the reception gains of the receivers become maximum are right and left, respectively

109.(Currently Amended) The positioning system according to ~~any of claims 106 to 108~~
claim 106, wherein

the positioning system is configure to determine entering/leaving of the moving body into/from a specified zone based on the unique information received by the receiver.

110. (Currently Amended) The positioning system according to ~~any of claims 106 to 108~~
claim 106, wherein

the positioning system is configure to determine the direction of the moving body based on the unique information received by the receiver.